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ABSTRACT

A 12-part paradigm for testing level of concept attainment was used to construct items covering the topics of sets, division, and expressing relationships. Within each topic the concepts presented in the middle elementary grades were identified; ten concepts were randomly selected for each topic; and, for each concept, items matching the tasks in the paradigm were developed. A total of 353 items appear in this paper, each presented in the form resulting from item tryouts and revisions. For related documents in this series, see SE 015 468 and SE 015 469. (Author/DT)

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Items to Test Level of Attainment of Mathematics Concepts by Intermediate Grade Children

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Report from the Project on A Structure of Concept Attainment Abilities

Wisconsin Research and Development
CENTER FOR COGNITIVE LEARNING

THE UNIVERSITY OF WISCONSIN
Madison, Wisconsin

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Working Paper No. 56

ITEMS TO TEST LEVEL OF ATTAINMENT OF MATHEMATICS CONCEPTS BY INTERMEDIATE-GRADE CHILDREN

by

Thomas A. Romberg and Jean Steitz

Report from the Project on A Structure of
Concept Attainment Abilities
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November, 1971

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Center for Cognitive Learning
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The Wisconsin Research and Development Center for Cognitive Learning focuses on contributing to a better understanding of cognitive learning by children and youth and to the improvement of related educational practices. The strategy for research and development is comprehensive. It includes basic research to generate new knowledge about the conditions and processes of learning and about the processes of instruction, and the subsequent development of research-based instructional materials, many of which are designed for use by teachers and others for use by students. These materials are tested and refined in school settings. Throughout these operations behavioral scientists, curriculum experts, academic scholars, and school people interact, insuring that the results of Center activities are based soundly on knowledge of subject matter and cognitive learning and that they are applied to the improvement of educational practice.

This Working Paper is from the Project on the Structure of Concept Attainment Abilities in Program 1 and from the Technical Development Program. The Concept Attainment staff took primary initiative in identifying basic concepts in mathematics at intermediate grade levels, while the Technical Development Program assisted in developing tests to measure concept achievement and identifying reference tests for cognitive abilities. The tests will be used to study the relationships among cognitive abilities and learned concepts in various subject matter areas. The outcome of the project will be a formulation of a model of structure of abilities in concept attainment in a number of subjects, including science, language arts, and social studies, as well as mathematics.

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ABSTRACT

Using a 12-part paradigm for testing level of concept attainment, items were constructed for three topics in mathematics--sets, division, and expressing relationships. Within each topic concepts presented in the middle elementary grades were identified and 10 concepts randomly selected for each topic. For each concept 12 items, one matching each task in the paradigm, were developed. The items are presented in the form resulting from item-tryouts and revision.

ITEMS TO TEST LEVEL OF ATTAINMENT OF MATHEMATICS CONCEPTS BY INTERMEDIATE-GRADE CHILDREN

Introduction

The general objectives of the Concept Attainment Abilities Project of the Wisconsin Research and Development Center for Cognitive Learning are as follows:

1. To identify basic concepts in language arts, mathematics, social studies, and science appropriate at the Fourth-Grade level.
2. To develop tests to measure achievement of these concepts.
3. To identify reference tests for cognitive abilities.
4. To study the relationships among levels of concept attainment in various subject matter areas and cognitive abilities.
5. To formulate a model of abilities in concept attainment.

The tests which were developed to measure achievement of selected mathematics concepts are contained in this paper. Tests for selected concepts in language arts, social studies, and science are contained in other Working Papers.

The nature of each item of the test was determined with respect both to content and to type of task involved. Thirty mathematics concepts were selected for inclusion in the test. Three major topics were chosen within the field of mathematics and associated concepts identified subsequently. Ten concepts were randomly selected from each set of concepts related to the three areas; in all 30 concepts were selected. The concepts selected for inclusion in the study are listed alphabetically according to topic in Table 1. Each concept was analyzed to determine its intrinsic attributes, definition, examples, supraordinate and subordinate concepts, and its relationship to another selected concept. A detailed description of the method by which mathematics concepts were selected and analyzed is given in Working Paper No. 55 (Romberg, Steitz, & Frayer, 1970).

The tasks represented in the test items were based on a paradigm for testing level of concept attainment (Frayer, Fredrick, & Klausmeier, 1969). The twelve tasks used from this paradigm were:

1. Given the name of an attribute, select the example of the attribute.
2. Given an example of an attribute, select the name of the attribute.
3. Given the name of a concept, select the example of the concept.
4. Given the name of a concept, select the nonexample of the concept.
5. Given an example of a concept. select the name of the concept.
6. Given the name of a concept, select the relevant attribute.
7. Given the name of a concept, select the irrelevant attribute
8. Given the meaning of a concept, select the name of the concept.
9. Given the name of a concept, select the meaning of the concept.
10. Given the name of a concept, select the supraordinate concept.
11. Given the name of a concept, select the subordinate concept.
12. Given the names of two concepts, select the statement which shows the relationship between them.

TABLE 1

Areas and Concepts for Mathematics

Sets	Division	Expressing Relationships
Disjoint Set	Denominator	Average
Empty Set	Division	Graph
Equal Sets	Factor	Measurement
Equivalent Sets	Fraction	Open Sentence
Line	Mixed Fraction	Place Holder
Parallel Lines	Multiplication	Place Value
Plane	Numerator	Solution Set
Point	Product	Standard Unit
Subset	Quotient	Statement
Subtration	Remainder	Weight

The test development strategy called for construction of 12 items for each concept, one of each task type. Since there were 30 concepts and 12 task types, it was anticipated that 360 unique items would be constructed. However, since no subordinate concept was identified for seven concepts only 353 items appear in this paper.*

The items as presented here are the result of writing initial items, critiquing each item, trying out the items on a large sample of students completing Fifth Grade and revising the items based on the results of data analysis. It should be noted that the items are ordered by concept in this Working Paper for the convenience of the reader. In the tryout, items for several concepts were randomly ordered and tested as a unit to avert the learning effect which would possibly occur if all items for a particular concept were answered sequentially. A maximum of 72 items was given in a test setting.

A future Technical Report will describe the procedures used in item development, statistical characteristics of the items, and the 42 subscales into which these 353 items are subdivided; there are 30 concept scales (one for each concept across the 12 tasks); and 12 task scales (one for each task totaled across the 30 concepts). Note that each item appears in two different scales--one concept scale and one task scale.

---

* There is no Item No. 11 for the following concepts: subtraction, parallel lines, multiplication, numerator, mixed fraction, average, and open sentence.

AREA: SETS

DISJOINT SETS

1. Which of the following has members?

   A. the club for all people over 150 yrs. old
   B. an empty field
   C. a football team

2. Your baseball team has:

   A. members
   B. denominators
   C. fractions

3. Which of the following shows two sets which are disjoint?

   A. {1,4,6} and {1,4,6}
   B. {1,4,6} and {11,44,66}
   C. {1,4,6} and {1,6,16}

4. Which of the following shows two sets which are NOT disjoint?

   A. {1,4,6} and {1,4,6}
   B. {1,4,6} and {11,44,66}

5. The set {1,2,3} and the set {7,8,9} are:

   A. empty sets
   B. equal sets
   C. disjoint sets
   D. parallel sets

6. Which of the following is true for all disjoint sets?

   A. They are equal sets.
   B. The sets contain five members.
   C. They have no common members.

7. Which of the following is true of some but NOT all disjoint sets?

   A. They have no members in common.
   B. They are made up of at least two sets.
   C. They have the same number of members.

8. What are sets called when they do not have any common members?

   A. intersecting sets
   B. equal sets
   C. disjoint sets
   D. empty sets

9. Disjoint sets are sets which:

   A. have no members
   B. have the same number of members
   C. do not have any common members

10. Disjoint is a kind of:

   A. set
   B. subtraction
   C. place holder
   D. operation
   E. factor

11. Of two sets which are disjoint, one of the sets could:

   A. have members in common with the other set
   B. be an empty set

12. What is true about disjoint sets and parallel lines?

   A. Parallel lines have points in common, so t ey make up disjoint sets.
   B. Parallel lines can be made by two disjoint sets of points.
   C. Both disjoint sets and parallel lines can intersect.

EMPTY SETS

1. Which of the following sets has no members?

   A. the club for all people over 150 yrs. old
   B. the set which contains the number 4
   C. the set of all even numbers
   D. a football team

2. A club for all people who are over 30 feet tall has:

   A. less that 10 members but more than 1 member
   B. no members
   C. too many members to count

3. Which of the following is an empty set?

   A. the set { }
   B. the set {n}
   C. the set {cat}
   D. the set {0}

4. Which of the following is <u>NOT</u> an empty set?

   A. the set {1,4,6}
   B. the set { }

5. The set {} is an example of:

   A. an open set
   B. a set of points
   C. an empty set
   D. an equal set

6. Which of the following is true for <u>all</u> empty sets?

   A. They are subsets of groups of points.
   B. They have no members.
   C. They are universal sets.
   D. They are subsets of groups of fractions.

EMPTY SETS (continued)

7. Which of the following is true for some but NOT all empty sets?

   A. They are shown as { }
   B. They are subsets of groups of points.
   C. They have no members.

8. The set without any members is called:

   A. the disjoint set
   B. the empty set
   C. the equivalent set

9. The empty set is:

   A. the set without any members
   B. the set containing zero as a member
   C. the set containing all members

10. All empty sets are a kind of:

   A. group of points
   B. group of fractions
   C. subset

11. Which of the following is a kind of empty set?

   A. the set of whole numbers
   B. the set of things which do not exist
   C. a disjoint set

12. What is true about equal sets and empty sets?

   A. Two empty sets can be called equal sets.
   B. Both have more than 10 members.
   C. Equal sets are empty sets.
   D. One empty set is called an equal set.

EQUAL SETS

1. In which of the following do both sides of the equation show the same amount?

   A. $2 \times 6 = 12$

   B. $3 + 7 = 13$

   C. $8 - \square = 5$

   D. $\frac{1}{2} = \frac{3}{4}$

2. What words best describe the equation $2 \times 6 = 12$?

   A. Both sides have odd numbers.

   B. Both sides show the same amount.

   C. Both sides are made up of fractions.

   D. All the numbers can be divided by 4.

3. In which of the following are both sides made up of equal sets?

   A. $\{1,4,5\} = \{1,3,7\}$

   B. $\{6 \div 3\} = \{2\}$

   C. $\{\frac{1}{4}\} = \{\frac{2}{4}\}$

   D. $\{4 + 25\} = \{30\}$

4. In which of the following are both sides <u>NOT</u> made up of equal sets?

   A. $\{1,4,7\} = \{1,4,7\}$

   B. $\{6 \div 3\} = \{2\}$

   C. $\{10 \times 20\} = \{200\}$

   D. $\{\frac{2}{4}\} = \{\frac{1}{4}\}$

5. The set [1,4,8] and the set [1,4,8] are:

   A. fractions

   B. equal

   C. empty

   C. disjoint

6. What is true for <u>all</u> equal sets?

   A. They are empty.

   B. They have the same members.

   C. They have members which are fractions.

   D. They are on graphs.

7. What is true for some but <u>NOT</u> all equal sets?

   A. They are made up of two or more sets.

   B. They have the same members.

   C. They are empty.

8. When two sets have the same members, the sets are called:

   A. equal

   B. empty

   C. straight

9. Equal sets are:

   A. two sets which have the same members

   B. two sets which have no common members

   C. two sets which only have the same number of members

EQUAL SETS (continued)

10. All equal sets are also:

    A. equivalent sets

    B. empty sets

    C. fractional sets

11. Fill in the blank. If two sets are ___?___ they could be called equal sets.

    A. disjoint

    B. intersecting

    C. factors

    D. empty

12. What is true about equal sets and subsets?

    A. Subsets and equal sets have the same members.

    B. Subsets and equal sets mean the same thing.

    C. Subsets are equal sets when they are made up of whole numbers.

    D. Equal sets are the same subset of a larger set.

EQUIVALENT SETS

1. Which of the following sets have the same number of members?

   A. {cat, dog} and {cat, rabbit, horse}
   B. {1,2,3 } and {4, 5}
   C. {2 apples} and {2 oranges}

2. The set {1, 10} and the set {5, 15}:

   A. have the same number of members
   B. have some common members
   C. are equal sets

3. Which of the following sets are equivalent?

   A. {2 apples} and {2 oranges}
   B. {1,9,10} and {8,9}
   C. {mouse, rat} and {cat}

4. Which of the following sets are <u>NOT</u> equivalent?

   A. {1,2,3} and {4,5,6,7}
   B. {4,5,6},and{7,8,9}

5. The set {cat, dog} and the set {bat, ball} are:

   A. equivalent sets
   B. equal sets
   C. empty sets

6. What is true for <u>all</u> equivalent sets?

   A. They are sets about animals.
   B. They have 3 members in each set.
   C. They have the same number of members.

7. What is true for some but <u>NOT</u> all equivalent sets?

   A. They have the same number of members.
   B. They are made up of two or more sets.
   C. They have 3 members in each set.

8. Any two sets which have the same number of members are called:

   A. empty sets
   B. open sets
   C. equivalent sets

9. Equivalent sets are:

   A. two sets which have different kinds of members
   B. two sets which have the same number of members
   C. two sets which are always empty

10. Equivalent sets are kinds of:

   A. subsets
   B. closed sets
   C. open sets

11. Kinds of equivalent sets are:

   A. pointed sets
   B. two sets with a different number of members
   C. equal sets

12. What is true about equivalent sets and subtraction?

   A. When two numbers are subtracted, the answer is called an equivalent set.
   B. If the members from two equivalent sets are subtracted, the answer is 0.
   C. If the number of members from two equivalent sets are subtracted, the answer is 0.

LINE

1. Which of the following has no end?

   A. •

   B.

   C.

2. This picture has:

   A. speed
   B. no end
   C. weight
   D. direction

3. Which of the following is an example of a line?

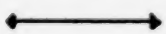
   A. •

   B.

   C.

   D.

4. Which of the following is <u>NOT</u> an example of a line?

   A. 

   B. •

5. is an example of:

   A. a line
   B. a point
   C. a plane

6. Which of the following is true of <u>all</u> lines?

   A. They have no end.
   B. They are ten inches long.
   C. They are curved.

7. Which of the following is true of some but <u>NOT</u> all lines?

   A. They have length
   B. They can be drawn using two points.
   C. They are 10 inches long.
   D. They have no end.

8. What is a group of points which has no end, but does have a length and can be drawn using two points?

   A. a plane
   B. a line
   C. a square

9. A line:

   A. can be drawn using three points not all on one line
   B. is a group of points which has no end, but does have a length and can be drawn using two points
   C. is an exact location

10. All lines are:

   A. a group of points
   B. intersecting
   C. parallel
   D. factors

11. Which of the following is a kind of a line?

   A. point
   B. a line segment
   C. a square line
   D. a list

12. What is true for a line and a plane?

   A. A line is formed when two planes are parallel.
   B. A plane can be formed from 3 points on one line.
   C. A plane can be formed from one line.
   D. A line is formed when two planes intersect.

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PARALLEL LINES

1. Which pair of numbers show the same distance on a number line?

   A. 4, 10 and 6, 12

   B. 1, 10 and 5, 6

   C. $\frac{1}{2}$, 1 and 1, $1\frac{3}{4}$

2. On a number line, the numbers 2, 5 and 6, 9 would:

   A. show the same distance
   B. now show the same distance

3. Which of the following are examples of parallel lines?

   A.

   B.

   C.

   D.

4. Which of the following are <u>NOT</u> examples of parallel lines?

   A.

   B.

5. is an example of two lines that:

   A. intersect
   B. have many points in common
   C. are skew
   D. are parallel

6. Which of the following is true for <u>all</u> lines that are parallel?

   A. They are curved.
   B. They are the same size.
   C. They are an equal distance away at each point.

7. Which of the following is true for some but NOT all lines that are parallel?

   A. There are at least two lines.
   B. They are an equal distance away at each point.
   C. They are the same length.

8. What describes two or more lines that are the same distance apart at every point?

   A. skew
   B. intersecting
   C. parallel

9. Parallel describes:

   A. two or more lines that are the same distance apart at every point
   B. one line that has many points
   C. two or more lines that meet in a point

10. Parallel lines are a kind of:

    A. number line
    B. circle
    C. group of points

11. No subordinate concept

12. What is true about parallel lines and an empty set?

    A. The empty set is made when one parallel line is longer than the other.
    B. The group of points where two parallel lines meet make up an empty set.
    C. The empty set tells about parallel lines that are curved.

PLANE

1. Which of the following has no end?

   A. a line
   B. a line segment
   C. a square

2. Which best tells about a line?

   A. It has no end.
   B. It always has a curve.
   C. It is a point.
   D. It is a plane.

3. Which of the following is an example of a plane?

   A. the corner of the room
   B. where the floor meets the wall
   C. a basketball
   D. the blackboard

4. Which of the following does NOT show a plane?

   A. where the floor meets the wall
   B. the blackboard
   C. your desk top

5. A wall is an example of:

   A. a plane
   B. two points
   C. a line

6. Which of the following is true for any plane?

   A. It is made up of only one line.
   B. It is round.
   C. It has no end.

7. Which of the following is true for some but NOT all planes?

   A. They are round.
   B. They are flat.
   C. They are made up of points.
   D. They are made up of lines.

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8. Which of the following can be made by only 3 points, not all on one line?

   A. a plane
   B. a circle
   C. a line
   D. a box

9. A plane:

   A. can be made by 2 end points
   B. can be made by only 3 points, not all on one line
   C. can be made by using factors

10. All planes are:

    A. intersecting
    B. sets of points
    C. skew
    D. sets of numbers

11. Which of the following are kinds of planes?

    A. lines
    B. points
    C. line segments
    D. intersecting

12. What is true about a line and a plane?

    A. A plane is part of a line.
    B. A plane is longer than a line.
    C. When put together, a line and a plane can meet in a point.
    D. A plane and a line mean the same thing.

POINT

1. Which of the following shows something that has an end?

   A.

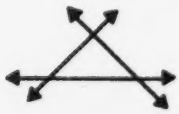
   B.

2. This shows something that has two:

   A. curves
   B. ends
   C. numerals
   D. factors

3. Which of the following shows a point?

   A. •

   B. 

   C.

   D.

4. Which of the following does <u>NOT</u> show a point?

   A. where tne floor meets the wall
   B. the tip of a pin
   C. .

5. The tip of a pin is an example of:

   A. a point
   B. a line
   C. a square

6. Which of the following is true of <u>all</u> points?

   A. They are at the place where two lines meet.
   B. They have no width.
   C. They are on the same line as all other points.

7. Which of the following is true of some but <u>NOT</u> all points?

   A. They have no width.
   B. They are on the same line as all other points.
   C. They have no length.

8. What is a location (place) that has no dimensions (length, width, or depth)?

   A. a circle
   B. a plane
   C. a line
   D. a point

9. A point:

   A. has two ends
   B. can be made by three points not all on one line
   C. is a location (place) that has no dimension (length, width, or depth)

10. A point is a kind of:

    A. place
    B. number
    C. measurement
    D. factor

11. Which of the following is a kind of point?

    A. the intersection of two lines
    B. the intersection of two planes
    C. two parallel lines
    D. two parallel planes

12. What is true about a line and two points?

    A. a straight line is the shortest distance between two points.
    B. a line has only one point on it.
    C. a line and two points are parallel.

SUBSET

1. Which of the following sets is part of the set {1, 2, 3, 4, 5}?

   A. the set {1, 3, 5}
   B. the set {6, 7, 8, 9, 10}
   C. the set {1, 2, 3, 4, 5, 6, 7}

2. Fill in the blank: The set {1, 3, 5, 10}is ____?____ the set {1, 2, 3, 4, 5, 10}.

   A. part of
   B. the same as
   C. equivalent to
   D. equal to

3. Which of the following is a subset of the set {1, 2, 3, 4, 5}?

   A. the set {6, 7, 8, 9, 10}

   B. the set $\{\frac{1}{2}, \frac{2}{4}, \frac{3}{6}, \frac{4}{8}, \frac{5}{10}\}$

   C. the set {1, 3, 5}

4. Which of the following is <u>NOT</u> a subset of the set {1, 2, 3, 4, 5}?

   A. the set {1, 2, 3, 4}
   B. the set {3, 4, 6, 7}

5. Fill in the blank. The set {1, 2, 3, 4} is ____?____ the set of all the whole numbers.

   A. equal to
   B. a subset of
   C. a factor of

6. Which of the following is true for <u>all</u> subsets of the whole numbers?

   A. Each subset is equal to another subset.
   B. They are a part of the set of whole numbers.
   C. They are empty.
   C. They have less than 5 members.

SUBSET (continued)

7. Which of the following is NOT true for all subsets of whole numbers?

   A. They are part of the set of whole numbers.
   B. They have a number of members.
   C. They are empty.

8. Which of the following means a set that is part of another set?

   A. disjoint set
   B. equal set
   C. subset

9. A subset means:

   A. a set which is equal to another set
   B. a set that is part of another set
   C. a set which has some members that are not in another set

10. All subsets are a kind of:

   A. measurement
   B. set
   C. point
   D. empty set

11. Which of the following is a special kind of subset?

   A. an empty set
   B. a factor
   C. a measurement

12. What is true about empty sets and subsets?

   A. An empty set is another name for any subset.
   B. The empty set has more members than other subsets.
   C. The empty set is a subset of every set.

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SUBTRACTION

1. Which circled number is an addend?

   A. ④ - 2 = 2

   B. $\begin{array}{r} 3 \\ ②\overline{)6} \end{array}$

   C. ② + 3 = 5

   D. 2 + 3 = ⑤

2. The circled numbers in ② + ③ = 5 are:

   A. differences
   B. sums
   C. addends

3. Which of the following shows subtraction?

   A. 5 - 3 = 2
   B. 2 x 3 = 6
   C. 10 ÷ 2 = 5
   D. 4 + 2 = 6

4. Which of the following does NOT show subtraction?

   A. 5 children, 2 of which are girls. The number of boys = 3.
   B. 4 - 2 = 2
   C. 4 + 1 = 5

5. 7 - 3 = 4 is an example of:

   A. addition
   B. subtraction
   C. multiplication
   D. division

6. What is true for all subtraction?

   A. It finds a missing addend.
   B. It uses whole numbers.
   C. It uses fractions.

SUBTRACTION (continued)

7. What is true for some but NOT all examples of subtraction?

   A. It uses fractions.
   B. It uses two numbers at one time.
   C. It has an answer called the difference.

8. An operation used to find a missing addend in addition is called:

   A. a factor
   B. multiplication
   C. subtraction
   D. division

9. Subtraction is:

   A. an operation used to find a missing addend in addition
   B. adding two or more numbers to form a sum
   C. an operation used to find a missing factor in multiplication

10. Subtraction is a kind of:

   A. operation
   B. multiplication
   C. place holder

11. No subordinate concept

12. What is true about division and subtraction?

   A. When two numbers are subtracted the operation is called division.
   B. Division is an operation showing repeated subtraction of the same number.
   C. In division, the number being divided is subtracted from the number to divide by.

AREA: DIVISION

DENOMINATOR

1. Which number in $2\overline{)6}$ (3) is the number to divide by?

   A. 3
   B. 2
   C. 6

2. The 5 in $5\overline{)20}$ (4) shows which number:

   A. to divide into
   B. to divide by
   C. is the answer
   D. is the remainder

3. Which of the following circled numbers is a denominator?

   A. $4\frac{1}{\textcircled{2}}$
   B. $4\frac{\textcircled{1}}{2}$
   C. $\textcircled{4}\frac{1}{2}$

4. Which of the following circled numbers is NOT a denominator?

   A. $\frac{1}{\textcircled{2}}$
   B. $4\frac{\textcircled{3}}{4}$

5. The number 3 in $\frac{2}{3}$ is a:

   A. denominator
   B. difference
   C. numerator

6. Which of the following is true of all denominators?

   A. They are a part of mixed fractions.
   B. They are below the dividing bar.
   C. They are also fractions.

7. Which of the following is NOT true of all denominators?

   A. They are also fractions.
   B. They are below the dividing bar.
   C. They are part of a fraction.

8. The number below the dividing bar in a fraction, is called a:

   A. sum
   B. denominator
   C. product
   D. numerator

9. A denominator is:

   A. the dividing bar in a fraction
   B. the number above the dividing bar in a fraction
   C. the number below the dividing bar in a fraction

10. Denominators are a kind of:

    A. difference
    B. product
    C. number
    D. sum

11. What kind of a denominator is shown in these fractions?

$$\frac{10}{8}, \frac{1}{8}, \frac{3}{8}, \frac{15}{8}$$

    A. odd
    B. mixed
    C. common

12. When a fraction is written as a mixed fraction the denominator:

    A. stays the same
    B. becomes smaller
    C. becomes larger

DIVISION

1. Which circled number is a divisor?

   A. $3 + \textcircled{2} = 5$

   B. $2 \times 3 = \textcircled{6}$

   C. $\textcircled{2}\overline{)6}\ 3$

   D. $\textcircled{6} - 4 = 2$

2. The 2 in $\boxed{2\overline{)6}\ 3}$ is the :

   A. quotient
   B. sum
   C. product
   D. divisor

3. Which of the following shows division?

   A. $3 + 2 = 5$

   B. $10 \div 5 = 2$

   C. $5 - 3 = 2$

   D. $2 \times 5 = 10$

4. Which of the following does <u>NOT</u> show division?

   A. $8 \div 4 = 2$

   B. $2\overline{)6}\ 3$

   C. $5 - 3 = 2$

5. $2\overline{)6}$ $\quad 3$ This is an example of:

A. subtraction
B. division
C. addition
D. multiplication

6. What is <u>always</u> true for division?

A. It has a quotient.
B. Numbers less than 10 are used.
C. There is a remainder which tells what is left over.

7. What is sometimes but <u>NOT</u> always true for division?

A. It has a quotient.
B. It is a way of looking at multiplication.
C. It is used to find a missing factor in multiplication.
D. There is a remainder.

8. An operation used to find a missing factor in multiplication is called:

A. subtraction
B. measurement
C. division

9. Division is:

A. an operation used to find the missing sum in addition
B. an operation which uses repeated addition of the same number
C. an operation which uses repeated factors
D. an operation used to find a missing factor in multiplication

10. All division is a kind of:

A. measurement
B. operation
C. addition

11. One kind of division is shown by:

A. factors
B. lines
C. fractions

12. What is true about fractions and division?

A. When fractions are added they form factors for division.
B. Fractions are a way of showing which number should be divided by which other number.
C. When two fractions are subtracted the problem becomes a division problem.

FACTOR

1. Which of the following circled numbers is part of a product?

   A. $6 \div \textcircled{2} = 3$

   B. $\textcircled{6} - 3 = 3$

   C. $\textcircled{2} + 3 = 5$

   D. $2 \times \textcircled{3} = 6$

2. The number 3 in $2 \times 3 = 6$ is:

   A. part of a product
   B. part of a quotient
   C. part of a sum
   D. part of a difference

3. In which one of the four examples is the circled number a factor?

   A. $\textcircled{5} + 2 = 7$

   B. $5 - \textcircled{2} = 3$

   C. $\textcircled{2} \times 3 = 6$

   D. $\textcircled{6} \div 2 = 3$

4. In which one of the two examples is the circled number <u>NOT</u> a factor?

   A. $\textcircled{2} \times 3 = 6$

   B. $2 \times 3 = \textcircled{6}$

5. The numbers 2 and 3 in $2 \times 3 = 6$ are:

   A. sums
   B. products
   C. differences
   D. factors

6. Which of the following is true for any factor?

   A. It can be divided by an even number.
   B. It is a fraction.
   C. It is a part of a product
   D. It is 0.

7. Which of the following is true for some but NOT all factors?

   A. They are part of a product.
   B. They are fractions.
   C. They are multiplied.

8. The numbers multiplied to form a product are called:

   A. factors
   B. sums
   C. fractions
   D. differences

9. Factors are:

   A. the numbers that are used in division
   B. the numbers that are subtracted to form a difference
   C. the numbers that are added to form a sum
   D. the numbers that are multiplied to form a product

10. Factors are a kind of:

    A. symbol holding the place for a number
    B. symbol showing an operation
    C. number
    D. place value

11. One kind of factor is:

    A. a multiplier
    B. an addend
    C. a sum

12. What is true about factors and addition?

    A. When adding two numbers that are the same, each number is called a factor.
    B. When looking at multiplication as repeated addition, one of the factors tells how many times the other factor should be added.
    C. When more than two numbers are used in addition problems, the rest of the numbers that are added become factors.
    D. When adding a list of numbers, which are all different, the sum is called a factor of the list.

FRACTION

1. $\boxed{1\frac{2}{3}}$ Which of these numbers is the denominator?

   A. 1
   B. 2
   C. 3

2. What is the name for the following circled number $\boxed{1\frac{2}{\textcircled{3}}}$?

   A. denominator
   B. numerator
   C. dividend

3. Which of the following is a fraction?

   A. $2\overline{)\,10}^{\,5}$

   B. $\frac{2}{5}$

   C. 1

4. Which of the following is <u>NOT</u> a fraction?

   A. 3

   B. $\frac{1}{2}$

5. $\frac{1}{2}$ is an example of:

   A. a whole number
   B. a fraction

6. Which of the following is true for <u>all</u> fractions?

   A. They are products.
   B. They are whole numbers.
   C. They are factors.
   D. They have a denominator.

FRACTION (continued)

7. Which of the following is NOT true of all fractions?

   A. They are whole numbers.
   B. They have numerators.
   C. They have denominators.
   D. They show division.

8. A number made up of a numerator and a denominator is called:

   A. a number line
   B. a measurement
   C. a whole number
   D. a fraction

9. A fraction is:

   A. a number which is a place value
   B. a number made up of factors
   C. a number made up of a numerator and a denominator

10. All fractions are a kind of:

   A. sum
   B. factor
   C. number

11. Which of the following is a kind of fraction?

   A. any factor
   B. an open fraction
   C. a mixed fraction
   D. any product

12. When two fractions are added what happens to the denominators?

   A. The denominators are dropped.
   B. They are added together like the numerator.
   C. They form one common denominator.
   D. The answer will still have two denominators, but will have only one numerator.

MIXED FRACTION

1. Which of the following fractions has a whole number part?

   A. $\frac{1}{2}$

   B. $1\frac{1}{2}$

2. In the fraction $3\frac{1}{2}$, the 3 is called:

   A. the denominator
   B. the whole number part
   C. the fraction part
   D. an even number

3. Which of the following is a mixed fraction?

   A. 10

   B. $1\frac{4}{5}$

   C. $\frac{2}{3}$

4. Which of the following is <u>NOT</u> a mixed fraction?

   A. $1\frac{4}{5}$

   B. $\frac{1}{2}$

5. $1\frac{4}{5}$ is called:

   A. an even number
   B. an odd number
   C. a whole number
   D. a mixed fraction

6. Which of the following is <u>always</u> true for a mixed fraction?

   A. It has a denominator.
   B. It is the answer in division.
   C. It is less than 10.

7. Which of the following is true for some but NOT all mixed fractions?

   A. One part of them is a whole number.
   B. They have a denominator.
   C. They are the answer in division.
   D. They are fractions.

8. A whole number plus a fraction is called:

   A. a mixed fraction
   B. a measurement
   C. a whole number
   D. an odd number

9. A mixed fraction is:

   A. a whole number plus a fraction
   B. a number which is less than 1
   C. made up of factors
   D. a fraction which has a place value

10. Mixed fractions are one kind of:

   A. denominator
   B. factor
   C. fraction

11. No subordinate concept

12. What is true about mixed fractions and fractions?

   A. A fraction is a number which is larger than a mixed fraction.
   B. If a whole number and a fraction are added the answer will be a mixed fraction.
   C. If a fraction is multiplied by a whole number the answer will be a mixed fraction.
   D. A mixed fraction is a fraction which has been divided.

MULTIPLICATION

1. Which of the following shows repeated addition of the same number?

   A. $6 \div 2 = 3$
   B. $4 - 2 = 2$
   C. $2 + 3 = 5$
   D. $2 \times 4 = 8$

2. $2 \times 3 = 6$ This shows:

   A. repeated division of the same number
   B. repeated addition of the same number
   C. repeated subtraction of the same number

3. Which of the following shows multiplication?

   A. $100 + 2 + 4 + 4 + 6 = 116$
   B. $4 - 1 = 3$
   C. $15 \times 10 = 150$
   D. $30 \div 2 = 15$

4. Which of the following does NOT show multiplication?

   A. $100 + 2 + 4 + 4 + 4 = 114$
   B. $3 \times 5 = 5 + 5 + 5$
   C. $152 = 76 \times 2$

5. $43 \times 2 = 86$ This is an example of:

   A. addition
   B. subtraction
   C. multiplication
   D. division

6. What is always true for multiplication?

   A. It has a product.
   B. It uses three numbers.
   C. Fractions are used.

MULTIPLICATION (continued)

7. What is true for some but NOT all examples of multiplication?

   A. They have a product.
   B. They use 3 numbers.
   C. They have a "times sign".
   D. They have factors.

8. An operation which uses repeated addition of the same number is called:

   A. subtraction
   B. multiplication
   C. division

9. Multiplication is:

   A. an operation which uses the difference between two numbers
   B. an operation which uses repeated subtraction of the same number
   C. an operation which uses repeated addition of the same number

10. Multiplication is a kind of:

    A. division
    B. operation
    C. subtraction
    D. number

11. No subordinate concept

12. What is true about fractions and multiplication?

    A. When a fraction is multiplied it is called a factor.
    B. When a fraction is multiplied it becomes a whole number.
    C. When a fraction is multiplied it is repeatedly subtracted.

NUMERATOR

1. In $5\overline{)\,15}^{\,3}$ which number is being divided?

   A. 3
   B. 5
   C. 15

2. The 10 in $2\overline{)\,10}^{\,5}$ shows

   A. which number is being divided
   B. which number is the answer
   C. which number to divide by

3. In $\frac{2}{3}$ which number is a numerator?

   A. 2
   B. 3

4. Which circled number is NOT a numerator?

   A. $\frac{\textcircled{2}}{3}$
   B. $\frac{\textcircled{4}}{4}$

5. The number 6 in $\frac{6}{7}$ is a:

   A. denominator
   B. numerator

6. Which of the following is true for all numerators?

   A. They are less than ten.
   B. They are fractions.
   C. They are the number above the line in a fraction.

7. Which of the following is true of some but NOT all numerators?

   A. They are less than ten.
   B. They are above the dividing bar.
   C. They are part of a fraction.
   D. They show the number which is being divided.

NUMERATOR (continued)

8. The number above the bar in a fraction is called a:

   A. numerator
   B. quotient
   C. denominator

9. A numerator is:

   A. the number below the bar in a fraction
   B. the number above the bar in a fraction
   C. a product

10. A numerator is a kind of:

   A. number
   B. product
   C. fraction
   D. measurement

11. No subordinate concept

12. What is the numerator in the following mixed fraction? $4\frac{5}{8}$

   A. 4
   B. 4 x 8 = 32
   C. (4 x 8) +5) = 37
   D. 8

PRODUCT

1. Which one of the following is the sum in $\boxed{2 + 4 + 6 + 10 = 22}$?

   A. 2
   B. 4
   C. 6
   D. 10
   E. 22

2. The 22 in $\boxed{2 + 4 + 6 + 10 = 22}$ is the:

   A. sum
   B. factor
   C. addend
   D. difference

3. Which circled number is a product?

   A. $4 + 1 = \textcircled{5}$

   B. $2 \times 5 = \textcircled{10}$

   C. $100 - 3 = \textcircled{97}$

   D. $15 \div 3 = \textcircled{5}$

4. Which circled number is NOT a product?

   A. $4 + 3 + 2 + 1 = \textcircled{10}$

   B. $2 \times 5 = \textcircled{10}$

5. The 45 in $\boxed{5 \times 9 = 45}$ is a:

   A. factor
   B. product
   C. quotient
   D. difference

6. Which of the following is always true for a product?

   A. It is a fraction.
   B. It is an answer.
   C. It is an even number.
   D. It is less than 10.

7. Which of the following is true for some but NOT all products?

   A. It is used in multiplication.
   B. It is an answer.
   C. It is a sum.
   D. It is a fraction.

8. The answer in multiplication is called:

   A. a product
   B. a factor
   C. an addend
   D. a quotient

9. A product is:

   A. the answer in division
   B. the answer in multiplication
   C. part of a statement
   D. the factors in a problem

10. A product is a kind of:

    A. answer
    B. sentence
    C. question
    D. statement

11. A kind of product is called:

    A. a denominator product
    B. an open product
    C. a partial product

12. What is true about fractions and a product?

    A. When two fractions are multiplied the answer is called the product.
    B. If two fractions are equal they are called a product of each other.
    C. If one fraction is larger than another fraction, the smaller one is called a product of the larger one.

QUOTIENT

1. $\boxed{12 \div 2 = 6}$ Which number is the answer?

   A. 2
   B. 6
   C. 12

2. The 6 in $\boxed{12 \div 2 = 6}$ is:

   A. an answer
   B. an addend
   C. a sum
   D. a factor

3. Which circled number is a quotient?

   A. $6 \div 2 = \textcircled{3}$
   B. $5 - 2 = \textcircled{3}$
   C. $2 \times 3 = \textcircled{6}$
   D. $3 + 1 = \textcircled{4}$

4. Which circled number is <u>NOT</u> a quotient?

   A. $\frac{4}{2} = \textcircled{2}$

   B. $2 \times 3 = \textcircled{6}$

   C. $10 \div 2 = \textcircled{5}$

5. The 6 in $\boxed{12 \div 2 = 6}$ is:

   A. a sum
   B. a quotient
   C. a remainder
   D. a product

6. Which of the following is <u>always</u> true for a quotient?

   A. It is a number in division.
   B. It is a mixed fraction.
   C. It is less than 10.

QUOTIENT (continued)

7. Which of the following is true for some but NOT all quotients?

   A. They are numbers.
   B. They have a remainder which tells what is left over.
   C. They are a part of division.

8. The answer in division is called:

   A. a quotient
   B. a product
   C. a sum
   D. a difference

9. A quotient is:

   A. the product of two numbers
   B. the answer in division
   C. the answer in multiplication
   D. the number left over after the answer is found in division

10. A quotient is a kind of:

   A. question
   B. answer
   C. statement
   D. sentence

11. One kind of quotient is:

   A. an open quotient
   B. a partial quotient
   C. a product quotient

12. What is true about a quotient and division?

   A. A partial quotient is found when dividing numbers under 10.
   B. In division, the quotient gives the number of times one number can be subtracted from a larger number.
   C. Quotients are numbers that are greater than the number being divided.
   D. In division, the quotient gives the number of times one number can be added to a larger number.

REMAINDER

1. Which of the following circled numbers is the difference between two numbers?

   A. $3 \times 4 = (12)$
   B. $(4) \div 2 = 2$
   C. $4 + 3 = (7)$
   D. $4 - 3 = (1)$

2. Fill in the blank. The 4 in $6 - 2 = 4$ shows ___?___ between two numbers.

   A. the quotient
   B. the sum
   C. the difference
   D. the product

3. $$\begin{array}{r} 4 \\ 2\overline{)\,9} \\ \underline{8} \\ 1 \end{array}$$ Which of these numbers is the remainder?

   A. 1
   B. 2
   C. 4

4. Which of the following circled numbers is NOT the remainder?

   A. $$\begin{array}{r} 5 \\ 2\overline{)11} \\ \underline{10} \\ (1) \end{array}$$

   B. $$\begin{array}{r} (4) \\ 2\overline{)\,9} \\ \underline{8} \\ 1 \end{array}$$

5. The 3 in $$\begin{array}{r} 5 \\ 5\overline{)\,28} \\ \underline{25} \\ 3 \end{array}$$ is an example of:

   A. a factor
   B. a remainder
   C. a sum
   D. a quotient

6. Which of the following is true for all remainders?

   A. They are left when you divide by 3.
   B. They are differences.
   C. They are fractions.
   D. They are less than 10.

7. Which of the following is NOT true for all remainders?

   A. They are less than four.
   B. They are found in division.
   C. They are differences.

8. What is the number that is left over after division called?

   A. an average
   B. a partial product
   C. a remainder
   D. addition

9. A remainder is:

   A. the answer in division
   B. the number that is left over after division
   C. the number that is left over after multiplication
   D. the factor in multiplication

10. A kind of remainder is:

    A. a set
    B. a whole number
    C. a quotient

11. A reminder is a kind of:

    A. fraction
    B. number
    C. subtraction
    D. operation

12. What is true about the remainder and the quotient?

    A. The quotient is always larger than the remainder.
    B. The quotient and remainder are used in multiplication if the factors are large numbers.
    C. When there is a remainder, the remainder and the quotient give the answer in division.
    D. The quotient is zero when the remainder is zero.

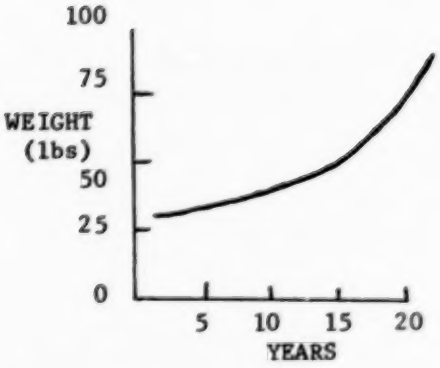
AREA: EXPRESSING RELATIONSHIPS

AVERAGE

1. Which of the following is a list of numbers?

A. 5
4
3
6
8

B.



C. Map scale

2. | 5 |
| 4 |
| 3 |
| 7 |
| 2 |

This is called:

A. a list of numbers
B. a graph
C. a table

3. For the list | 5 |
| 6 |
| 7 |
| 8 |
| 9 |
| 10 |
| 11 |
| 56 |

which of the following give the average?

A. Average = 11 - 5 = 6

B. Average = $\frac{8}{7\overline{)56}}$

C. Average = 56

D. Average = 56 - 7 = 49

52 13

4. The average of the list $\begin{array}{|r|}\hline 6 \\ 8 \\ 9 \\ 1 \\ 11 \\ 20 \\ 1 \\ \hline 56 \\ \hline \end{array}$ is NOT:

   A. Average = 56

   B. Average = $7\overline{)56}$ = 8

5. Fill in the blank. The circled number in $9\overline{)45}$ = $\textcircled{5}$ shows the _____ of the following list of numbers.

$\begin{array}{r} 1 \\ 2 \\ 3 \\ 4 \\ 5 \\ 6 \\ 7 \\ 8 \\ 9 \\ \hline 45 \end{array}$

   A. sum
   B. range
   C. graph
   D. average

6. Which is always needed for finding an average?

   A. a fraction
   B. a list of numbers
   C. standard units

7. Which is needed for finding some but NOT all averages?

   A. list of numbers
   B. a sum of a group of numbers
   C. the number 10 in a group of numbers

8. The sum of a list of numbers divided by the number of numbers in the list is called:

   A. an average
   B. a range
   C. a standard unit

9. An average is:

   A. the total of all the numbers that are included in a list of numbers
   B. a measure of distance covered by a group of people
   C. the sum of a list of numbers divided by the number of numbers in the list

10. An average is a kind of:

   A. standard unit
   B. measure
   C. weight
   D. graph

11. No subordinate concept

12. What is true about the average of the following list of numbers: 1,2,3,4,5?

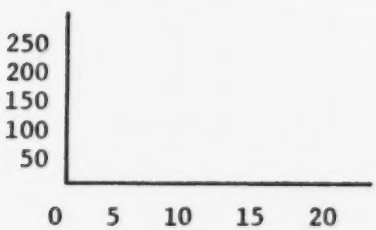
   A. It will be a whole number.
   B. It will be a fraction.
   C. It will be zero.

GRAPH

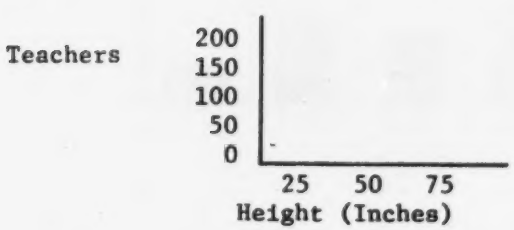
1. Which of the following drawings has labels?

A.

B.

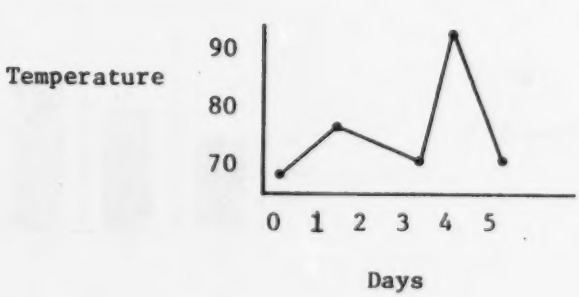


C.



2. In the following graph both temperature and days are called:

A. measurements
B. labels
C. numbers



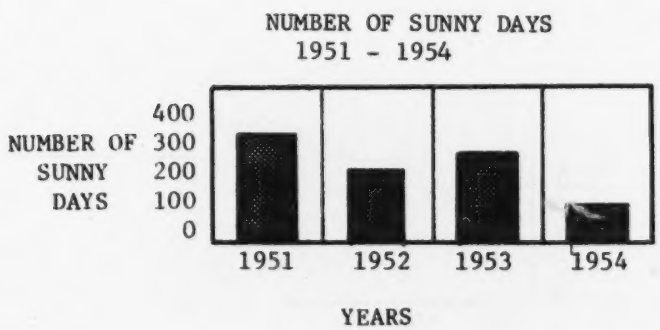
3. Which of the following is a graph?

A.

NUMBER OF SUNNY DAYS
1951

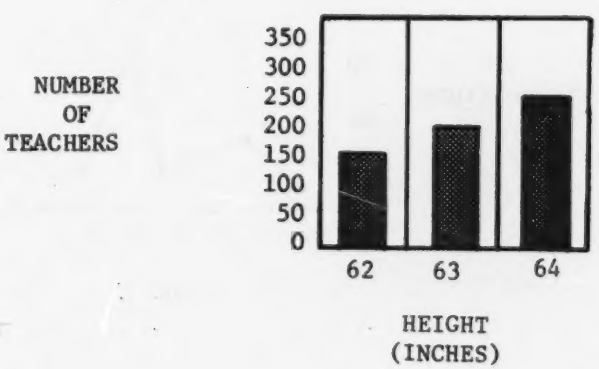
Year	Month	Day	Sunny
1951	Jan.	1	Yes
		2	No
		3	No
		4	No

B.



4. Which of the following is NOT a graph?

A.

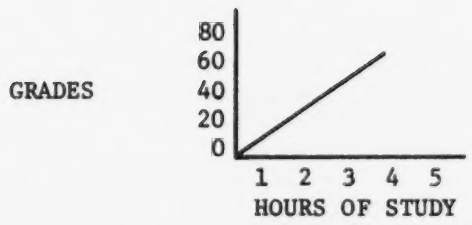


B.

NUMBER OF RAINY DAYS
1969

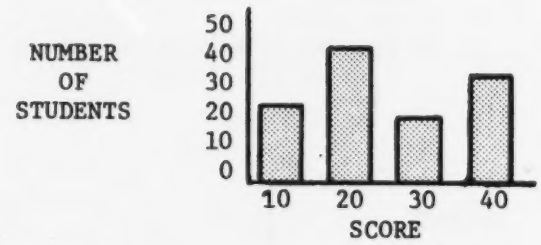
Year	Month	Day	Rain
1969	Feb.	1	Yes
		2	No
		3	No

C.



5. This is an example of a:

A. a map
B. a graph
C. a list of numbers



6. <u>All</u> graphs have:

A. ten measurements which are drawn on the graph
B. bars that are higher than 30 points
C. labels which tell what is measured and how it is measured

7. All graphs do <u>NOT</u> have:

A. measurements which are pictured on the graph
B. bars that measure higher than 30 points
C. labels which tell what is measured and how it is measured

8. A picture of two or more sets of measurements is:

   A. a graph
   B. a plane
   C. a statement
   D. a map

9. A graph is:

   A. a measure of area
   B. a group of two or more numbers
   C. a picture of two or more sets of measurements

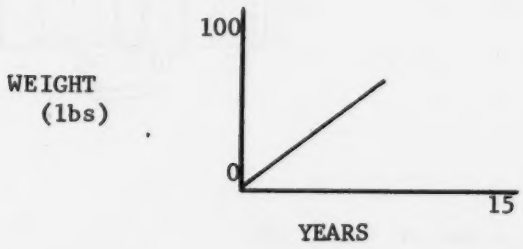
10. Any graph is a kind of:

   A. measurement
   B. picture
   C. weight

11. Which of the following is a kind of graph?

   A. this test
   B. a bar graph
   C. a picture of a page in your book

12.



What is true about weight as shown on the graph above?

   A. Weight stayed the same over the years.
   B. Weight increased over the years.
   C. Weight decreased over the years.

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MEASUREMENT

1. Which of the following is a unit of measure which shows in what way an object is being compared?

   A. length
   B. area
   C. inch

2. What word or words describe all the underlined words?
   2 inches, 3 hours, 10 pounds

   A. units of measure
   B. amounts
   C. numbers
   D. heights

3. Which of the following shows a measurement?

   A. Jack's house is larger than Sue's house.
   B. Jane jumped high.
   C. Jack is 4 feet tall.

4. Which of the following is NOT a measurement?

   A. Tom's snake is 10 inches long.
   B. Jack saw many.
   C. $\frac{1}{2}$ pound.

5. Mary weighed 60 pounds. 60 pounds is an example of:

   A. a fraction
   B. a unit of measure
   C. a measurement
   D. a number

6. All measurements need:

   A. a graph to show a picture of the measurements that are made
   B. a ruler which helps a person to be able to take the measurement
   C. a unit of measure which shows in what way the object is being measured
   D. a fraction which shows the amount measured

7. Some but NOT all measurements need:

   A. a graph to show a picture of the measurements that are made
   B. a unit of measure which shows in what way the object is being measured
   C. a number which shows what amount is being measured

8. A comparison of some size of an object to a unit of measure is called:

   A. a measurement
   B. a weight
   C. a number

9. Measurement means:

   A. a comparison of some size of an object to a unit of measure
   B. a comparison of some object or amount to a number
   C. a unit
   D. a number

10. All measurements are a kind of:

   A. factor
   B. pound
   C. comparison
   D. length

11. Which of the following is a kind of measurement?

   A. a set
   B. a plane
   C. a length

12. Measurements are used on graphs to show:

   A. a picture of a comparison of two or more objects
   B. a label for the measurements
   C. an open sentence

OPEN SENTENCE

1. Which of the following puts an equation into words?

   A. There are ten teachers who work hard.
   B. The difference between six and two is equal to four.
   C. A graph is made from a list of 10 measurements.

2. The difference between six and two is equal to four. This puts:

   A. a fraction into words
   B. an equation into words
   C. whole numbers into fractions

3. Which of the following is an open sentence?

   A. The difference between 6 and 3 is equal to 3.
   B. The sum of 2 and some number is the same as five.
   C. The sum of 5 and 3 is greater than 2.

4. Which of the following is NOT an open sentence?

   A. The difference between 6 and 3 is less than 5.
   B. The sum of 2 and some number is the same as five.

5. $5 + \square > 2$ is an example of:

   A. a true statement
   B. a false statement
   C. a solution set
   D. an open sentence

6. Which of the following is true for all open sentences?

   A. They are addition problems.
   B. They use letters, like an "X."
   C. They have place holders which hold the place for numbers.

7. Which of the following is true for some but NOT all open sentences?

   A. They make true statements when solved.
   B. They have place holders which hold the place for numbers.
   C. They are equations put into words.

8. A sentence which uses a place holder is called:

   A. an open sentence
   B. a true statement
   C. a false statement
   D. a closed sentence

9. An open sentence is:

   A. a sentence which uses a place holder
   B. a sentence that is either true or false
   C. a sentence which gives a place value

10. Open is the name for a kind of:

   A. sentence
   B. statement
   C. set

11. No subordinate concept

12. What is correct for an open sentence and a statement?

   A. When a statement is completed it makes an open sentence true.
   B. An open sentence is either a true or a false statement.
   C. An open sentence is true but a statement is false.
   D. An open sentence is not true or false but a statement is either true or false.

PLACE HOLDER

1. Which number in 16,785,002 has a place value of one thousand?

   A. 5
   B. 2
   C. 5,002

2. Fill in the blank. The 3 in 98,345 is in the hundredths place. One hundred is then called the ___?___ of the number 3.

   A. distance
   B. set
   C. decimal
   D. place value

3. Which of the following has a place holder?

   A. The sum of 5 and 3 is less than 10.
   B. The sum of 2 and some number is the same as five.
   C. The difference between 6 and 2 is greater than 4.

4. Which of the following does NOT have a place holder?

   A. The sum of 2 and some number is the same as 5.

   B. $6 \times 4 < \square$

   C. The sum of 5 and 3 is less than 10.

5. $2 \times 3 < \square$ This has:

   A. a statement
   B. division
   C. a place holder

6. Which of the following is always true for a place holder?

   A. It holds a place for a number.
   B. It is an X.
   C. It is a $\square$

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7. Which of the following is NOT always true for a place holder?

   A. It holds a place.
   B. It can stand for a set of numbers.
   C. It is a □

8. A symbol which holds a place for a number is called:

   A. a point
   B. division
   C. a fraction
   D. a place holder

9. A place holder is:

   A. a sentence that is a true statement
   B. the value given to a place in a number system
   C. a symbol which holds a place for a number

10. A place holder is a kind of:

    A. statement
    B. fraction
    C. symbol
    D. number

11. A kind of place holder is a:

    A. letter
    B. statement
    C. point
    D. graph

12. What is true about solution sets and a place holder?

    A. Solution sets contain place holders when they are false statements.
    B. Solution sets replace the place holder in an open sentence.
    C. Place holders are used in solution sets.

PLACE VALUE

1. In the number 134, the place that the number 3 holds has what value?

   A. one's
   B. three's
   C. ten's

2. For the number 4, one's is:

   A. the value given to the place 4 holds
   B. how the number 4 will be added to another number
   C. 4's place holder

3. Which of the following is the place value for 4 in 684?

   A. 4
   B. one's
   C. last number

4. Which of the following is NOT a place value?

   A. dozen's
   B. one's
   C. hundred's
   D. ten's

5. Fill in the blank. The ten's place is an example of _____.

   A. a place value
   B. an average place
   C. a fraction place
   D. a place holder

6. Which of the following is always true about a place value?

   A. It is a value given to a place.
   B. The place value is shown by the number holding the place.
   C. A one is in the ten's place.

PLACE VALUE (continued)

7. Which of the following is true of some but NOT all place values?

   A. They are values given to places.
   B. They are used in our number system.
   C. A zero is in the one's place.

8. The value given to a place which a number holds is called:

   A. a place value
   B. a place holder
   C. an average

9. Place value is:

   A. the value given to a place which a number holds
   B. the value of the sum of the measures divided by the number of measures
   C. a symbol which holds a place for a numeral

10. Place value is a kind of:

   A. graph
   B. symbol
   C. rule
   D. set

11. One kind of place value is used for:

   A. whole numbers
   B. planes
   C. points
   D. lines

12. What is true about a numerator and a place value?

   A. The numerator is the place value of a fraction.
   B. The numbers that form a numerator have place values.
   C. A place value has a numerator and a denominator.

SOLUTION SET

1. Which of the following could replace the Y in 2 + Y = 10 and make the problem true?

   A. 8
   B.
   C. 5

2. How can the number 5 be used in making the problem 10 ÷ Y = 2 true?

   A. 5 could replace the Y
   B. 5 could be added to 10
   C. $\frac{2}{5}$ is the answer

3. Which of the following is a solution set for 2 x ☐ = 10?

   A. { 1 }

   B. { 5 }

4. Which of the following is NOT a solution set for 4 x ☐ = 24?

   A. { 10 }

   B. { 6 }

5. For 7 x ☐ = 42, the set { 6 } is called:

   A. the solution set
   B. a false statement
   C. the empty set
   D. a place holder

6. Which of the following is true for all solution sets?

   A. They make an open sentence a true statement.
   B. They contain one number.
   C. They are made up of fractions.

SOLUTION SET (continued)

7. Which of the following is true for some but NOT all solution sets?

   A. They replace the place holder in a problem.
   B. They make an open sentence a true statement.
   C. They contain one number.

8. The set of numbers that make an open sentence a true statement is called:

   A. a false statement
   B. the empty set
   C. the solution set

9. A solution set is:

   A. the set of all even numbers
   B. the set of all place holders in an open sentence
   C. the set of numbers that make an open sentence a true statement

10. A solution set is a kind of:

    A. factor
    B. statement
    C. answer

11. Which can make up a kind of solution set?

    A. whole numbers
    B. lines
    C. statements

12. What is a solution set for the following subtraction problem?
    $5 - \square < 3$

    A. {5,4}
    B. {1,0}
    C. {3,2}
    D. {2}

STANDARD UNIT

1. Which of the following is always the same?

   A. the weather
   B. the number of days in a week
   C. the time it takes to eat lunch

2. The number of days in a week is an example of something which:

   A. changes once a year
   B. is always the same
   C. changes once a month

3. Which of the following is a standard unit?

   A. pound
   B. your hand
   C. any stick

4. Which of the following is NOT a standard unit?

   A. an inch
   B. a pound
   C. a stick
   D. a ton

5. Inch is an example of:

   A. a standard unit
   B. a unit of weight
   C. a unit of comparison but not a standard one
   D. a place holder

6. Which of the following is true for all standard units?

   A. They are used to measure weight.
   B. They are used when measuring length.
   C. They are agreed upon by a group of people.

STANDARD UNIT (continued)

7. Which of the following is true for some but NOT all standard units?

   A. They don't change.
   B. They are agreed upon by a group of people.
   C. They are used to measure weight.

8. A unit of measure that becomes a standard by common agreement or by law is called:

   A. a standard unit
   B. a number unit
   C. a place holder

9. A standard unit is:

   A. one of the numbers multiplied to form a product
   B. the greatest measure minus the least measure
   C. a unit of measure that becomes a standard by common agreement or by law

10. A standard unit is a kind of:

    A. factor
    B. place holder
    C. measure

11. One kind of standard unit is used for measuring:

    A. beauty
    B. multiplication steps
    C. length

12. When two measurements are added what happens to the standard unit?

    A. It is added.
    B. It stays the same.
    C. It is dropped.
    D. It is subtracted.

STATEMENT

1. Which of the following is true?

   A. $10 \div 4 = \frac{1}{2}$

   B. $2 \times 3 = 6$

   C. $6 \times \square = 12$

   D. $4 + 3 = 6$

2. $\boxed{2 \times 3 = 6}$ This is:

   A. true
   B. false
   C. neither true or false

3. Which of the following is a statement?

   A. The sum of 2 and some number is the same as five.

   B. The difference between 6 and 2 is equal to 4.

   C. $5 + 3 < \square$

   D. $6 \times \square = 12$

4. Which of the following is NOT a statement?

   A. The sum of 5 and 3 is equal to 8.

   B. The difference between 6 and 2 is equal to 4.

   C. $2 + \square = 5$.

5. $2 \times 3 = 6$ is an example of:

   A. fractions
   B. a statement
   C. a false sentence
   D. division

STATEMENT (continued)

6. Which of the following is true for all math statements?

   A. They are either true or false.
   B. They are about two equal sets.
   C. They use fractions.

7. Which of the following is true for some but NOT all math statements?

   A. They use fractions.
   B. They are about things equal to, less than or greater than other things.
   C. They are either true or false.

8. A sentence that is either true or false is called:

   A. a statement
   B. an open sentence
   C. a place holder

9. A statement is:

   A. a sentence that is either true or false
   B. a sentence that uses a place holder
   C. the group of numbers that make a sentence true

10. A statement is a kind of:

    A. place holder
    B. number
    C. sentence

11. A kind of statement is:

    A. a true statement
    B. a statement with a place holder
    C. a solution statement

12. What is true about a statement and weight?

    A. Each statement has a weight that is different.
    B. Weights are given to empty statements.
    C. A statement can be made about weights.

WEIGHT

1. Which of the following shows how heavy an object is?

   A. feet
   B. pounds
   C. dozens

2. What does pounds show about an object?

   A. how much
   B. how long
   C. how heavy

3. Which of the following shows weight?

   A. 10 square yards
   B. 10 pounds
   C. 10 feet
   D. 10 dozen

4. Which of the following does NOT show weight?

   A. 10 ounces
   B. 10 dozen
   C. 10 tons

5. 10 pounds is a measure of:

   A. area
   B. length
   C. width
   D. weight

6. Which of the following is always true about weight?

   A. Big objects are heavy.
   B. Objects weigh less than 10 pounds.
   C. It is measured in tons.
   D. It has a unit of measure.

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7. Which of the following is sometimes but NOT always true about weight?

   A. Weight has a unit of measure which tells how it is being measured.
   B. Weight is a measurement.
   C. Small objects are light.
   D. It tells "how heavy."

8. The measure of how light or heavy an object is is called:

   A. area
   B. weight
   C. length
   D. the mean

9. Weight is:

   A. the measure of how light or heavy an object is
   B. the sum of the measures divided by the number of measures
   C. the measure of the area of an object

10. All weights are:

   A. a mean
   B. a measure
   C. an area
   D. a graph

11. Which of the following shows one kind of weight?

   A. square inches
   B. pounds
   C. dozen
   D. mile

12. What is true for weight and standard unit?

   A. Standard units are a kind of weight.
   B. A standard unit for weight is an ounce.
   C. A standard unit for weight is a mile.
   D. Weight is a heavy standard unit.

APPENDIX

Key to Correct Answers for Mathematics Items

	Task Types											
Area: Sets	1	2	3	4	5	6	7	8	9	10	11	12
Empty Set	A	B	A	A	C	B	B	B	A	C	B	A
Equal Set	A	B	B	D	B	B	C	A	A	A	D	D
Subset	A	A	C	B	B	B	C	C	B	B	A	C
Equivalent	C	A	A	A	A	C	C	C	B	A	C	C
Subtraction	C	C	A	C	B	A	A	C	A	A	*	B
Disjoint Set	C	A	B	A	C	C	C	C	C	A	B	B
Point	B	B	A	A	A	B	B	D	C	A	A	A
Line	B	B	B	B	A	A	C	B	B	A	B	D
Parallel Lines	A	A	B	A	D	C	C	C	A	C	*	B
Plane	A	A	D	A	A	C	A	A	B	B	D	C
Area: Division	1	2	3	4	5	6	7	8	9	10	11	12
Division	C	D	B	C	B	A	D	C	D	B	C	B
Multiplication	D	B	C	A	C	A	B	B	C	B	*	A
Factor	D	A	C	B	D	C	B	A	D	C	A	B
Product	E	A	B	A	B	B	D	A	B	A	C	A
Quotient	B	A	A	B	B	A	B	A	B	B	B	B
Fraction	C	A	B	A	B	D	A	D	C	C	C	C
Denominator	B	B	A	B	A	B	A	B	C	C	C	A
Numerator	C	A	A	A	B	C	A	A	B	A	*	C
Mixed Fraction	B	B	B	B	D	A	C	A	A	C	*	B
Remainder	D	C	A	B	B	B	A	C	B	B	B	C
Area: Expressing Relationships	1	2	3	4	5	6	7	8	9	10	11	12
Measurement	C	A	C	B	C	C	A	A	A	C	C	A
Standard Unit	B	B	A	C	A	C	C	A	C	C	C	B
Weight	B	C	B	B	D	D	C	B	A	B	B	B
Graph	C	B	B	B	B	C	B	A	C	B	B	B
Average	A	A	B	A	D	B	C	A	C	B	*	A
Statement	B	A	B	C	B	A	A	A	A	C	A	C
Solution Set	A	A	B	A	A	A	C	C	C	C	A	A
Open Sentence	B	B	B	A	D	C	C	A	A	A	*	D
Place Holder	A	D	B	C	C	A	C	D	C	C	A	B
Place Value	C	A	B	A	A	A	C	A	A	C	A	B

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